

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
6 June 2002 (06.06.2002)

PCT

(10) International Publication Number
WO 02/44091 A2

(51) International Patent Classification: C02F 1/44

SK, SL, TT, TM, TR, TI, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(21) International Application Number: PCT/NL.01/00865

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

(22) International Filing Date:
29 November 2001 (29.11.2001)

Declaration under Rule 4.17:

as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

(25) Filing Language: Dutch

(26) Publication Language: English

(30) Priority Data:
1016771 1 December 2000 (01.12.2000) NL

(71) Applicant (for all designated States except US):
KIWA N.V. [NL/NL], Groningenhaven 7, NL-3433
PE Nieuwegein (NL).

(72) Inventor; and
(75) Inventor/Applicant (for US only): GALJAARD, Gilbert
[NL/NL], Runstraat 27, NL-1016 GK Amsterdam (NL).

(74) Agent: BRAS, P., c/o Octrooibureau Vriesendorp &
Giaade, P.O. Box 266, NL-2501 AW The Hague (NL).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI,

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A2

(54) Title: A METHOD FOR THE PURIFICATION OF WATER BY MEANS OF FILTRATION USING A MICRO OR ULTRA FILTRATION MEMBRANE

(57) Abstract: The present invention relates to a method for purification of water by means of dead-end filtration using a micro or ultra filtration membrane, wherein the filtration is periodically interrupted to cleanse the membrane, wherein prior to, during the start or during each filtration period a filtration aid is added to the water to be purified, so that a layer of said filtration aid is deposited on the membrane, wherein the filtration aid comprises particles of an ion-exchange resin having a particle size of 0.5 to 50 μm . The filtration aid preferably is added in a high concentration prior to or during the start of each filtration period. With the method according to the invention the water is completely freed in a single purification step from suspended and colloidal matter and specific dissolved elements such as for instance hardness, manganese, ammonium, assimilable organic carbon and colour.

WO 02/44091 A2

A method for the purification of water by means of filtration using a micro or ultra filtration membrane

The present invention relates to a method for the purification of water by means of dead-end filtration using a micro or ultra filtration membrane, wherein prior to, during the start or during each filtration period a suspension of a filtration aid is added to the water to be purified, so that a layer 5 of said filtration aid is deposited on the membrane.

Micro and ultra filtration are known techniques for the purification of water that are used for the production of for instance drinking water, domestic and industrial water.

10 In micro filtration and ultra filtration water (feed) is let to pass along a polymeric or ceramic membrane. During the filtration stage water, under the influence of pressure as driving force, is pressed through the membrane (permeate) whereas suspended matter, colloidal matter and 15 large organic molecules remain on the membrane. The quantity of water that passes a square meter of membrane per hour is called flux. The particles that remain cause fouling that is shown in an increase of the pressure drop over the membrane. Periodically therefore the membrane is cleansed by flowing the membrane in opposite direction for a short while 20 (often called "backflush"). Clean water is pressed from the permeate side to the feed side, as a result of which the layer of dirt is removed and discharged (retentate). The membrane can also be cleansed by letting water and/or water and air pass along the dirt layer on the membrane at high 25 speed (often called "forward flush" or "air flush"). Because such cleansings often leave a small quantity of pollutants behind, a cleansing using chemicals is regularly carried out (often called "chemical cleansing" or

- 2 -

"enhanced backwash"). The filtration process is therefore divided into several cycles, wherein a filtration cycle is followed by a rinsing cycle. After a number of filtration and rinsing cycles a chemical cleansing is carried out.

5

During the filtration stage the membranes can be operated in "cross-flow" or "dead-end" mode. In cross-flow mode only a part of the feed water is discharged as permeate during the filtration stage, while the remaining part leaves the membrane element again, whereas in dead-end mode all the 10 feed water is pressed through the membranes. The membranes can be designed like tubular, capillary or flat membranes.

The great advantage of micro and ultra filtration is that by using said techniques a very good product quality is achieved in a single process step.

15 The removal of suspended and colloidal matter (including bacteria and viruses) can be called absolute in comparison with conventional purifications. In addition said product quality is independent of the changes in the feed. The broad applicability renders micro and ultra filtration attractive for the production of both drinking-water and domestic and 20 industrial water, or as pre-purification in the production of demi-water. As a result of developments in the membrane technology and improved operation (including cleansing regimes) the treatment of a large range of water qualities is technically and economically feasible.

25 In a number of cases the above-mentioned techniques cannot be used because of a high fouling rate and/or an instable operation. In such cases the pressure over the membrane recovers insufficiently after a backflush and a chemical cleansing. The fouling will then be so extreme that the membranes periodically have to be thoroughly cleansed or in some cases 30 have to be replaced. In such cases a dose of a filtration aid may be a solution to stabilise the process. Several techniques have been described to that end:

- 3 -

- "In-linecoagulation": in this technique a coagulation agent is continuously dosed to the feed flow. Due to the coagulation agent small particles present in the water are flocculated to form larger ones. As a result said particles may clog up the pores of the membrane to a lesser extend. [P. van der Maas et al, 1999.]
- "Coating/body feed": in this technique a particles suspension is continuously dosed to the feed flow. Said particles (in most cases activated carbon) disrupt the cake building on the membrane as a result of which said cake is more easily separated from the membrane during cleansing. [Y. Matsui, 2000.]
- "Pre-coating": in this technique a suspension having a high concentration of particles is dosed on the membrane prior to the start or during the start of the filtration cycle. The particles form a protective layer or pre-coat on the membrane. During the filtration cycle suspended matter in the feed water is trapped by the pre-coat instead of by the membrane. During backflush the pre-coat layer is separated from the membrane and the trapped layer is discharged with the pre-coat particles. [G. Galjaard et al, 2000.]

Although micro and ultra filtration are very suitable for the removal of suspended and colloidal matter, dissolved elements such as for instance ions (salt), humic acids, pesticides/herbicides and organic micro pollutants (a number of specific organic carbon compounds) are not retained by micro and ultra filtration membranes, or only to a small extent.

In the production of high-quality drinking water or industrial water (for instance demineralised water for refrigeration purposes) additional purification steps are used for the removal of said dissolved elements. In

- 4 -

such a purification micro and ultra filtrations can be considered pre-treatment- or "polishing" techniques that act as a "disinfection screen" for the following steps. The use of several purification steps renders the water production expensive.

5

As noted above, the use of micro or ultra filtration will often be considered in the purification of water, especially when disinfection is necessary. In many cases, however, also a part of the dissolved elements will have to be removed as well, as a number of said dissolved elements may cause problems. For instance ammonium and assimilable organic carbon (AOC) may cause the growth of bacteria in the distribution system, in the installations of the customers or in the subsequent purification. Another dissolved substance that may cause problems is for instance manganese which after oxidation may form a black deposit that is difficult to remove.

10

Recently the use was suggested of separate ion exchange columns for the removal of dissolved substances [C. Charnock, 2000 and S.G.J. Heijman et al 1999] and colour [S. Verbych et al 2000, W.H. Höll et al, 2000]. So, here an additional step in the purification of water is used.

15

It is therefore an object of the invention to provide a method with which both suspended and colloidal material and dissolved elements can be removed in a single purification step.

20

According to the invention this object is achieved by dosing ion-exchange particles to the membrane prior to or during the filtration, in water purification by means of dead-end filtration using a micro or ultra filtration membrane.

25

Thus the invention provides a method for the purification of water by means of dead-end filtration using a micro or ultra filtration membrane, wherein the filtration is periodically interrupted to cleanse the membrane

- 5 -

and wherein prior to, during the start or during each filtration period a filtration aid is added to the water to be purified, so that a layer of said filtration aid is deposited on the membrane, characterized in that the filtration aid comprises particles of an ion-exchange resin having a particle 5 size of 0.5 to 50 μm .

With the method according to the invention the water is completely freed in a single purification step from suspended and colloidal matter and specific dissolved elements such as for instance hardness, manganese, am-10 monium, assimilable organic carbon and colour.

The method according to the invention can be carried out using the known micro and ultra filtration membrane materials and designs.

15 The membrane may for instance be a spiral wound membrane, a flat membrane or a capillary membrane. For large-scale production ($> 250 \text{ m}^3/\text{h}$) it is preferred to use compact membrane modules that are provided with a large number of capillary membranes (hollow fibres, having a fibre diameter of for instance 0.5 mm). Examples of materials of such capillary 20 membranes are hydrophilic polyether sulphone (PES), polysulphone (PS), polypropylene (PP), cellulose acetate (CA), polyacrylonitrile (PAN) polyvinylidene fluoride (PVDF) or polyvinyl pyrrolidine (PVD).

In carrying out the method of the invention the membranes are operated in 25 "dead-end" mode.

The ion-exchange particles may suitably be added to the water to be purified in the form of a suspension of the particles in water.

30 Both cation-exchange resins and anion-exchange resins can be used as ion-exchange resin in the method of the invention. It is also possible to use a mixture of said resins. The choice of the resin to be used is determined by

- 6 -

the analysis of the water to be purified and the intended use of the purified water.

The ion-exchange resin particles have a particle size of 0.5-150 μm ,
5 preferably 0.5-20 μm . The particle size of the ion exchange resin is con-
siderably smaller than the particle size of 0.2-1.2 mm of the common ion-
exchange resins in separate columns for the removal of substances. The
suitable particle size of the resin to be used according to the invention
depends on the type of synthetic resin and the desired retention of the
10 specific dissolved substances.

The ion-exchange resins to be used preferably are micro-porous. Examples
of suitable ion-exchange resins include Duolite AP 143/1093 (by Rohm &
Haas) and Amberlite IRP69/IRP64 (by Rohm & Haas).

15 The layer of ion-exchange resin particles may be deposited by continuously
dosing the particles during each filtration period. The suspension of resin
particles can also be dosed prior to or during the start of each filtration
period. When the suspension is added prior to the start of the filtration
20 period, a layer of deposited particles is present on the membrane prior to
the start of the filtration. The layer of resin particles preferably is applied to
the membrane by dosing a suspension of ion-exchange resin particles
having a relatively high concentration (pulse dose) during a short period
(<5 minutes in a filtration period of 15 to 60 minutes), prior to or at the
25 start of the filtration period. After said pulse dose, the dosing of the
suspension of particles can also be continued in a low concentration during
the filtration cycle. The concentration of resin particles in the suspension is
determined by the set dose time and the wanted thickness of the layer. A
suitable thickness of the layer is 3 to 5 times the diameter of the dosed
30 synthetic resin particles.

After a certain filtration time or after a certain pressure difference over the

- 7 -

membrane has been achieved, the membrane is backflushed. The layer of particles carrying the trapped substances (both suspended and colloidal matter and dissolved substances) is separated from the membrane and is flushed out of the membrane device. The concentrate flow with separated 5 particles is received in a separation tank wherein the synthetic resin is separated from the remainder of the fluid. The synthetic resin particles are transported back to the suspension tank from where the particles can be dosed again. After the particles have been used a number of times, they are regenerated with a salt solution after which they can be used again.

- 8 -

Literature

Chang Y-J, Choo K-H, Benjamin., M.M., Reiber S., *Combined adsorption - UF process increases TOC removal*, Journal AWWA vol 90, 1998.

5

Galjaard G., Paassen van J., Buijs P., Schoonenberg G., *Enhanced Pre-Coat Engineering. The Solution for Fouling?*, Proceedings of the Conference on Membranes in Drinking and Industrial Water Production, Volume 1, page 605-610, ISDN 0-86689-060-2, October 2000, Desalination Publications

10 I'Aquila, Italy.

Galjaard G., Schoonenberg F., de Jonge J., *Meetprotocol Quick-Scan: vergelijken van MF/UF membraanprestaties*. Kiwa rapport SWE 98.008, December 1998.

15

Maas P. van der, Leiting E., Dost S., Eppinga E., van Hoof S., *Customizes water Supplies: producing high quality process water from surface water using membrane technology*, Proceedings AWWA membrane Technology Conference, Long Beach (Calif.) 1999.

20

Y. Matsui, *Effect of operational modes on the removal of a synthetic organic chemical by powderedactivated carbon during ultrafiltration*, Proceedings of the Conference on Membranes in Drinking and Industrial Water Production, Volume 1, page 215-224, ISDN 0-86689-060-2, 25 October 2000, Desalinations Publications I'Aquila, Italy.

S. Verbych, M. Bryk, A. Alpatova, *Extraction of heavy metal ions from water solutions*, Proceedings of the Conference Innovations in Conventional and Advanced Water Treatment Processes, September 2000.

30

W.H. Höll, C. Bartosch, X. Zhao, S. He, *Elimination of trace heavy metals from drinking water by means of weakly basic anion exchangers*,

- 9 -

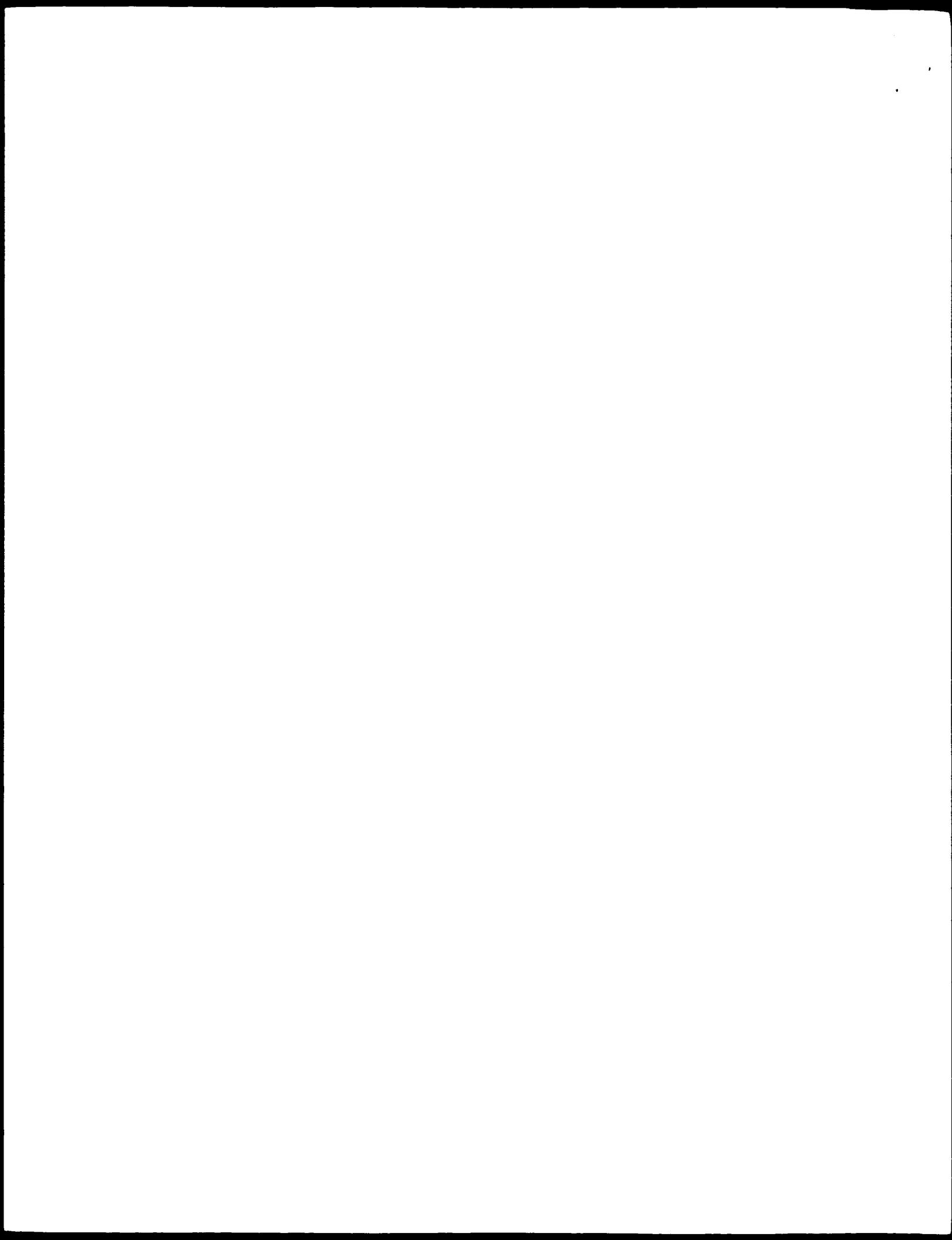
Proceedings of the Conference Innovations in Conventional and Advanced Water Treatment Processes, September 2000.

5 S.G.J. Heijman, A.M. van Paassen, W.G.J. van der Meer, R. Hopman,
Adsorptive removal of natural organic matter during drinking water treatment, Water Science and Technology, Volume 40, No. 9, page 183-190, 1999, Elsevier GB.

10 C. Charnock, O. Kjønno, *Assimilable organic carbon and biodegradable dissolved organic carbon in Norwegian raw and drinking waters*, Water Res. Volum 34, No. 10, page 2649-2642, 2000 Elsevier GB.

Claims

1. A method for the purification of water by means of dead-end filtration using a micro or ultra filtration membrane, wherein the filtration is periodically interrupted to cleanse the membrane, wherein prior to, during the start or during each filtration period a filtration aid is added to the water to be purified, so that a layer of said filtration aid is deposited on the membrane, **characterized in that** the filtration aid comprises particles of an ion-exchange resin having a particle size of 0.5 to 50 μm .
5
2. A method according to claim 1, wherein prior to or during the start of each filtration period the filtration aid is added in a high concentration.
10
3. A method according to claim 1 or 2, wherein after filtration has taken place during a certain period of time or after a certain pressure drop has occurred over the membrane, the layer of ion-exchange resin including the pollutants trapped in it or on it is removed from the membrane, the ion-exchange resin is separated and optionally after regeneration, is used again 15 as filtration aid.



(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
6 June 2002 (06.06.2002)

PCT

(10) International Publication Number
WO 02/044091 A3

(51) International Patent Classification¹:
B01D 61/14, C02F 1/42, B01D 37/02

C02F 1/44.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(21) International Application Number: PCT/NL01/00865

(22) International Filing Date:
29 November 2001 (29.11.2001)

(25) Filing Language: Dutch

(26) Publication Language: English

(30) Priority Data:
1016771 1 December 2000 (01.12.2000) NL

(71) Applicant (for all designated States except US):
KIWA N.V. [NL/NL]; Groningenhaven 7, NL-3433
PE Nieuwegein (NL).

(72) Inventor; and

(75) Inventor/Applicant (for US only): GALJAARD, Gilbert
[NL/NL]; Runstraat 27, NL-1016 GK Amsterdam (NL).

(74) Agent: BRAS, P.; c/o Octrooibureau Vriesendorp &
Gaade, PO Box 266, NL-2501 AW The Hague (NL).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,
LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX,
MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI,
SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU,
ZA, ZM, ZW.

Declaration under Rule 4.17:

as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii)) for the following designations AE,
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH,
CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB,
GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP,
KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,
MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD,
SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN,
YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW,
MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM,
AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT,
BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC,
NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Published:

with international search report
before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments

(88) Date of publication of the international search report:
15 August 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/044091 A3

(54) Title: A METHOD FOR THE PURIFICATION OF WATER BY MEANS OF FILTRATION USING A MICRO OR ULTRA FILTRATION MEMBRANE

(57) Abstract: The present invention relates to a method for purification of water by means of dead-end filtration using a micro or ultra filtration membrane, wherein the filtration is periodically interrupted to cleanse the membrane, wherein prior to, during the start or during each filtration period a filtration aid is added to the water to be purified, so that a layer of said filtration aid is deposited on the membrane, wherein the filtration aid comprises particles of an ion-exchange resin having a particle size of 0.5 to 50 μm . The filtration aid preferably is added in a high concentration prior to or during the start of each filtration period. With the method according to the invention the water is completely freed in a single purification step from suspended and colloidal matter and specific dissolved elements such as for instance hardness, manganese, ammonium, assimilable organic carbon and colour.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 01/00865A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C02F1/44 B01D61/14 C02F1/42 B01D37/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C02F B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 008, no. 193 (C-241), 5 September 1984 (1984-09-05) -& JP 59 087092 A (ORGANO KK), 19 May 1984 (1984-05-19) abstract; figures page 566, column 1, line 2 page 566, column 2, line 5 - line 7 page 567, column 1 page 569, column 2	1,2
Y	-& DATABASE WPI Derwent Publications Ltd., London, GB; AN 1984-290884 XP002199015 & JP 59 087092 A abstract -& DATABASE CA 'Online' CHEMICAL ABSTRACTS SERVICE, COLUMBUS, -/-	3

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

- *X* document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

- *Y* document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

- *&* document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

16 May 2002

25/06/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Hoornaert, P

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 01/00865

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	OHIO, US; retrieved from STN Database accession no. 101:197900 XP002199013 abstract --- PATENT ABSTRACTS OF JAPAN vol. 2000, no. 11, 3 January 2001 (2001-01-03) -& JP 2000 218110 A (JAPAN ORGANO CO LTD), 8 August 2000 (2000-08-08) abstract; claim 1; figures paragraphs '0010!-'0027! paragraph '0034! -& DATABASE WPI Derwent Publications Ltd., London, GB; AN 2000-539836 XP002199016 & JP 2000 218110 A abstract ---	1,2
X	PATENT ABSTRACTS OF JAPAN vol. 014, no. 275 (C-0728), 14 June 1990 (1990-06-14) -& JP 02 083020 A (JAPAN ORGANO CO LTD), 23 March 1990 (1990-03-23) abstract; figures page 111, column 2 page 113, column 1 -& DATABASE WPI Derwent Publications Ltd., London, GB; AN 1990-135514 XP002199017 & JP 02 083020 A abstract -& DATABASE CA 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; retrieved from STN Database accession no. 113:197559 XP002199014 abstract ---	1,2
Y	US 3 250 703 A (LEVENDUSKY JOSEPH A) 10 May 1966 (1966-05-10) figures column 3, line 10 -column 6, line 3 column 6, line 21 - line 38	3
A	---	1,2
	---	-/-

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
A	EP 0 633 066 A (GRAVER CO) 11 January 1995 (1995-01-11) abstract; figures 1,2 column 4, line 15 -column 5, line 18 column 9, line 6 - line 36 column 12, line 40 - line 45 column 13, line 23 - line 32 -----	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 01/00865

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
JP 59087092	A 19-05-1984	JP	3053999 B	16-08-1991
JP 2000218110	A 08-08-2000	NONE		
JP 02083020	A 0	NONE		
US 3250703	A 10-05-1966	GB	1066231 A	26-04-1967
EP 0633066	A 11-01-1995	US	5376278 A	27-12-1994
		CA	2126739 A1	02-01-1995
		CN	1111542 A	15-11-1995
		DE	69409716 D1	28-05-1998
		DE	69409716 T2	05-11-1998
		EP	0633066 A1	11-01-1995
		FI	943144 A	02-01-1995
		JP	7136426 A	30-05-1995
		MX	9405034 A1	31-01-1995

